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DRAFT WORK PLAN FOR

# BIOVENTING PILOT TEST
# BULK FUEL STORAGE AREA
# McGuire AFB, New Jersey

PREPARED FOR

**AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE**
**ENVIRONMENTAL RESTORATION DIVISION**
**McGuire Air Force Base, New Jersey 08641-5045**

**USAF CONTRACT F33615-90-D-4014, DELIVERY ORDER 14**

PREPARED BY

ES
ENGINEERING-SCIENCE
Liverpool, New York

AUGUST 1992
SY268.15.02

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# DRAFT

# BIOVENTING TEST WORK PLAN FOR

# BULK FUEL STORAGE AREA

# MCGUIRE AFB, NEW JERSEY

**Prepared For**

**AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE**
**ENVIRONMENTAL RESTORATION DIVISION**
**MCGUIRE AIR FORCE BASE, NEW JERSEY 08641-5045**

**USAF CONTRACT F33615-90-D-4014, DELIVERY ORDER 14**

**Prepared By**

**Engineering-Science, Inc.**
**290 Elwood Davis Road**
**Liverpool, New York 13088**

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# SECTION 1

# INTRODUCTION

This test work plan presents the scope of an in situ bioventing pilot test for treatment of fuel contaminated soils within the Bulk Fuel Storage Area (BFSA) at McGuire Air Force Base (AFB), New Jersey. The pilot tests have three primary objectives: 1) to assess the potential for supplying oxygen throughout the contaminated soil depth, 2) to determine the rate at which indigenous microorganisms will degrade fuel when stimulated by oxygen rich soil gas, and 3) to evaluate the potential for sustaining these rates of biodegradation until fuel contamination is remediated below regulatory standards.

If bioventing proves to be feasible at this site, pilot test data will be used to design a full-scale remediation system and to estimate the time required for site cleanup. An added benefit of the pilot testing is that a significant amount of the fuel contamination should be biodegraded during the one year pilot test since the testing will take place within the most contaminated soils on the site.

This test will involve injection at one vent well with a 40 scfm blower producing a radius of influence of approximately 40 feet. In situ rates of fuel biodegradation will be determined for individual soil vapor monitoring points.

Additional background information on the development and recent success of the bioventing technology is found in the attached document entitled "Test Plan and Technical Protocol For A Field Treatability Test For Bioventing." This protocol document will also serve as the primary reference for pilot test well designs and detailed procedures which will be used during the test.

# SECTION 2

# SITE DESCRIPTION

## 2.1 SITE LOCATION AND HISTORY

The BFSA at McGuire AFB is located in the central portion of the base. It is flanked by the base heating plant on the west, McGuire Boulevard on the east, West Arnold Avenue on the south and by a small tributary to the South Run on the north. The BFSA is in a fenced area with a total of 8 above ground storage tanks (Figure 2.1) used for the storage of JP-4 jet turbine fuel and No. 2 heating oil.

In 1984, a spill occurred during a transfer of JP-4 from a railcar to one of the storage tanks on the northeastern corner of the BFSA. Subsequent site investigations indicated petroleum contaminated soils and groundwater in the vicinity of the spill. Ten on-site monitoring wells were sampled as part of the investigations. The wells located between the tank farm and the South Run tributary contained free phase petroleum product or dissolved petroleum constituents that could be associated with the spill. Free product thicknesses ranged from a visible sheen to approximately 6.5 inches.

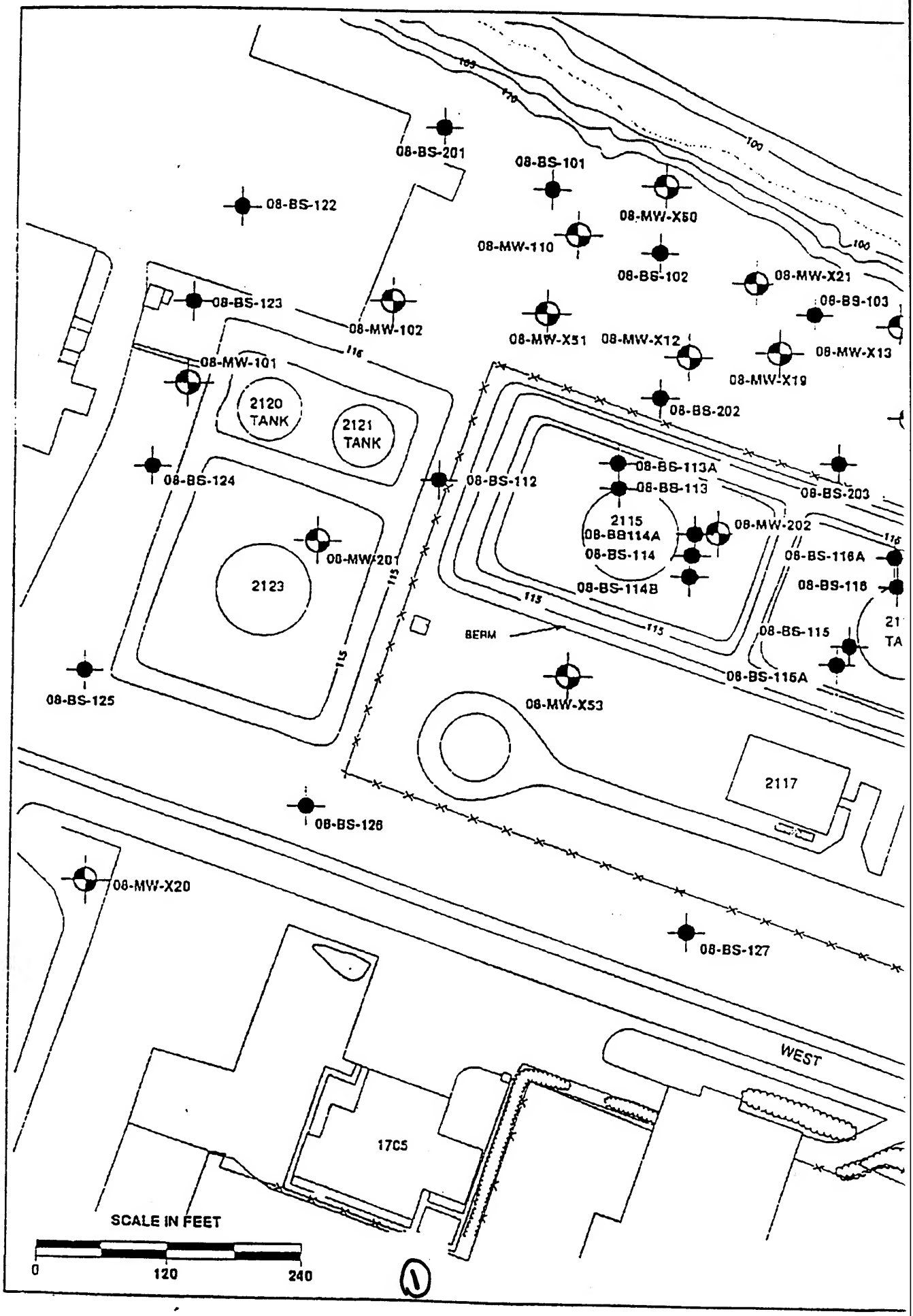
## 2.2 SITE GEOLOGY

Because the bioventing technology is applied to the unsaturated soils, this section will primarily address soils above the shallow aquifer. Based on boring logs of previous work, the unsaturated zone at the site consists of Pleistocene marine sand and silt. Ground water is encountered within the sand and silt in the release area at a depth of approximately 10 to 12 feet. Groundwater flows generally north-northwest toward a surface drainage stream approximately 100 to 150 feet from the release area.

Due to the relatively homogeneous nature of the sand and silt deposits, the permeability of soils to air flow should remain relatively constant across the site. Effective bioventing on this site is likely. ES has completed successful bioventing projects within similar geological deposits and we are confident that oxygen can be distributed in these soils. Soil vapor monitoring points (VMP's) will be positioned at three locations in and adjacent to the release area. At each of the locations, two 1/2" dia. VMP's will be installed as a cluster at two depths to study the subsurface oxygen distribution pattern prior to and during the pilot test.

## 2.3 SITE CONTAMINANTS

The primary contaminants on this site are JP-4 fuel residuals which have migrated to a depth of approximately 10 feet where the maximum depth to groundwater is encountered. Free product with thickness up to 6.5 inches has been observed in monitoring wells on the site immediately north of the BFSA.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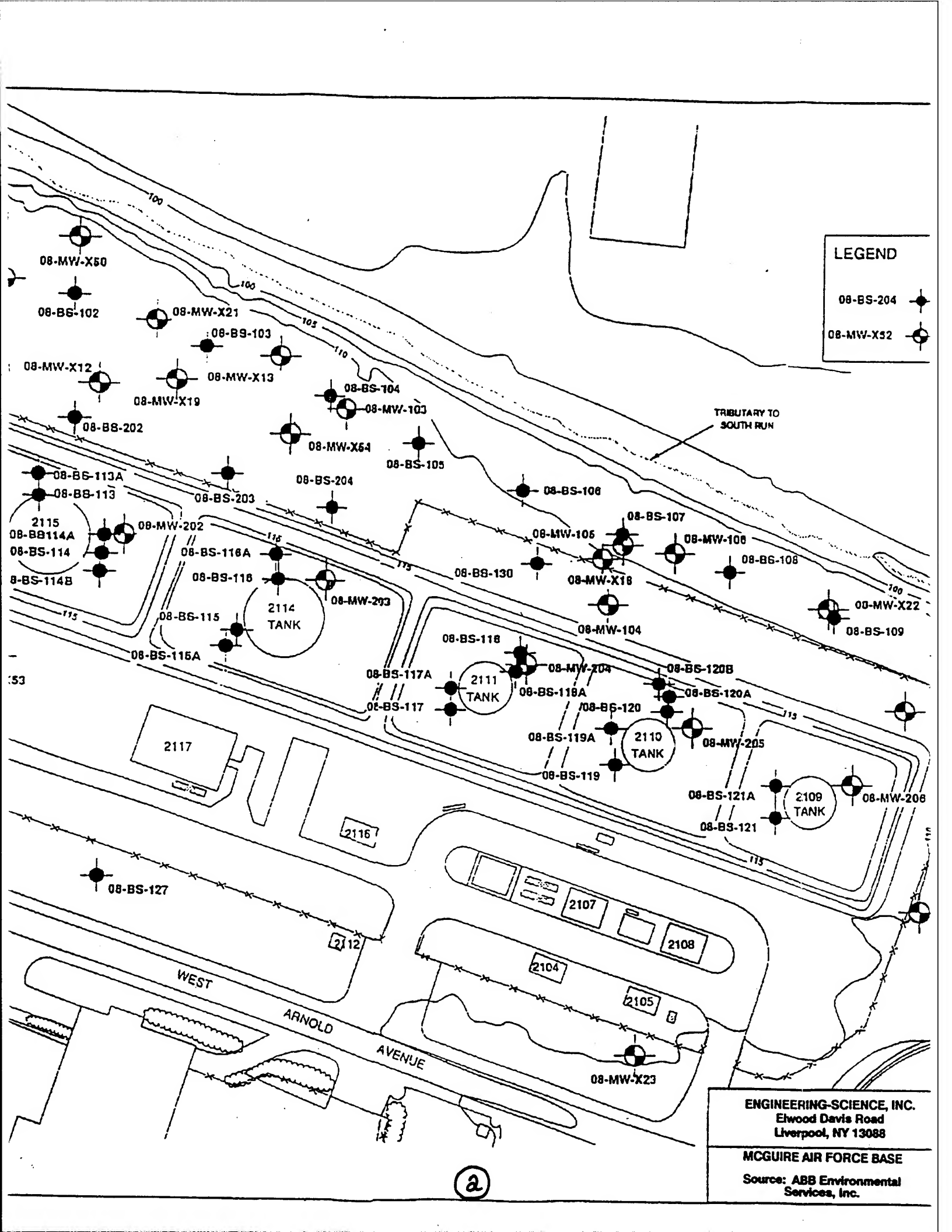
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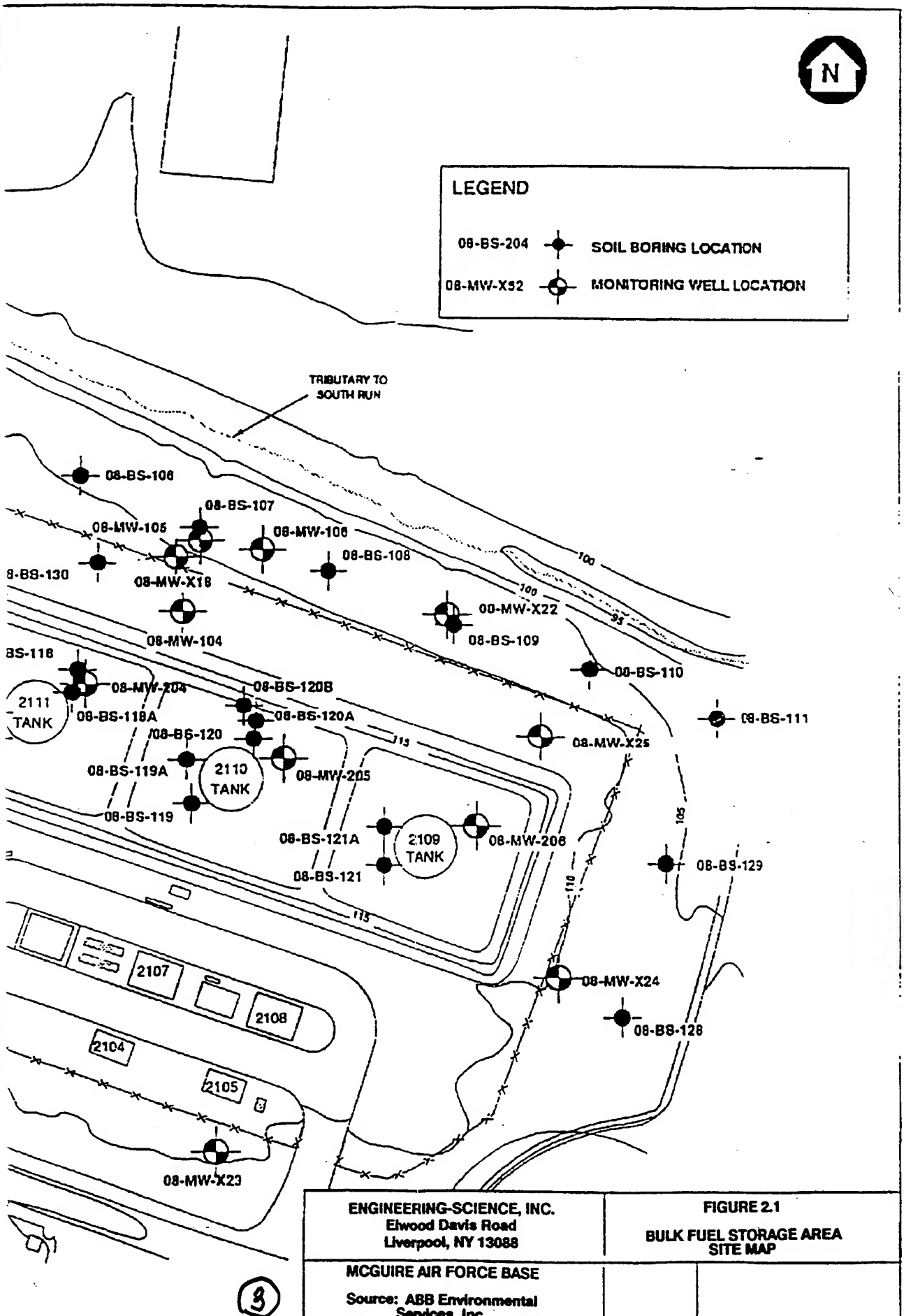
2116
08-BS-127
2107
2108
2104
2105
2112
WEST
ARNOLD
AVENUE
08-MW-X23
ENGINEERING-SCIENCE, INC.
Elwood Davis Road
Liverpool, NY 13088
MCGUIRE AIR FORCE BASE
Source: ABB Environmental Services, Inc.
2




| | |
|---|---|
| ENGINEERING-SCIENCE, INC.<br>Elwood Davis Road<br>Liverpool, NY 13088 | FIGURE 2.1<br>BULK FUEL STORAGE AREA<br>SITE MAP |
| MCGUIRE AIR FORCE BASE<br>Source: ABB Environmental Services, Inc. | |

3

Hydrocarbon contamination in the form of BTEX and heavier components were detected in the soils at concentrations up to 3,000 mg/kg. Chlorinated compounds were also detected in soils at the site at concentrations of less than 100 ug/kg. Due to the short duration of the air permeability and in-situ respiration tests at the BFSA, little or no change in contaminant levels will occur.

## SECTION 3

## SITE SPECIFIC ACTIVITIES

### 3.1 INTRODUCTION

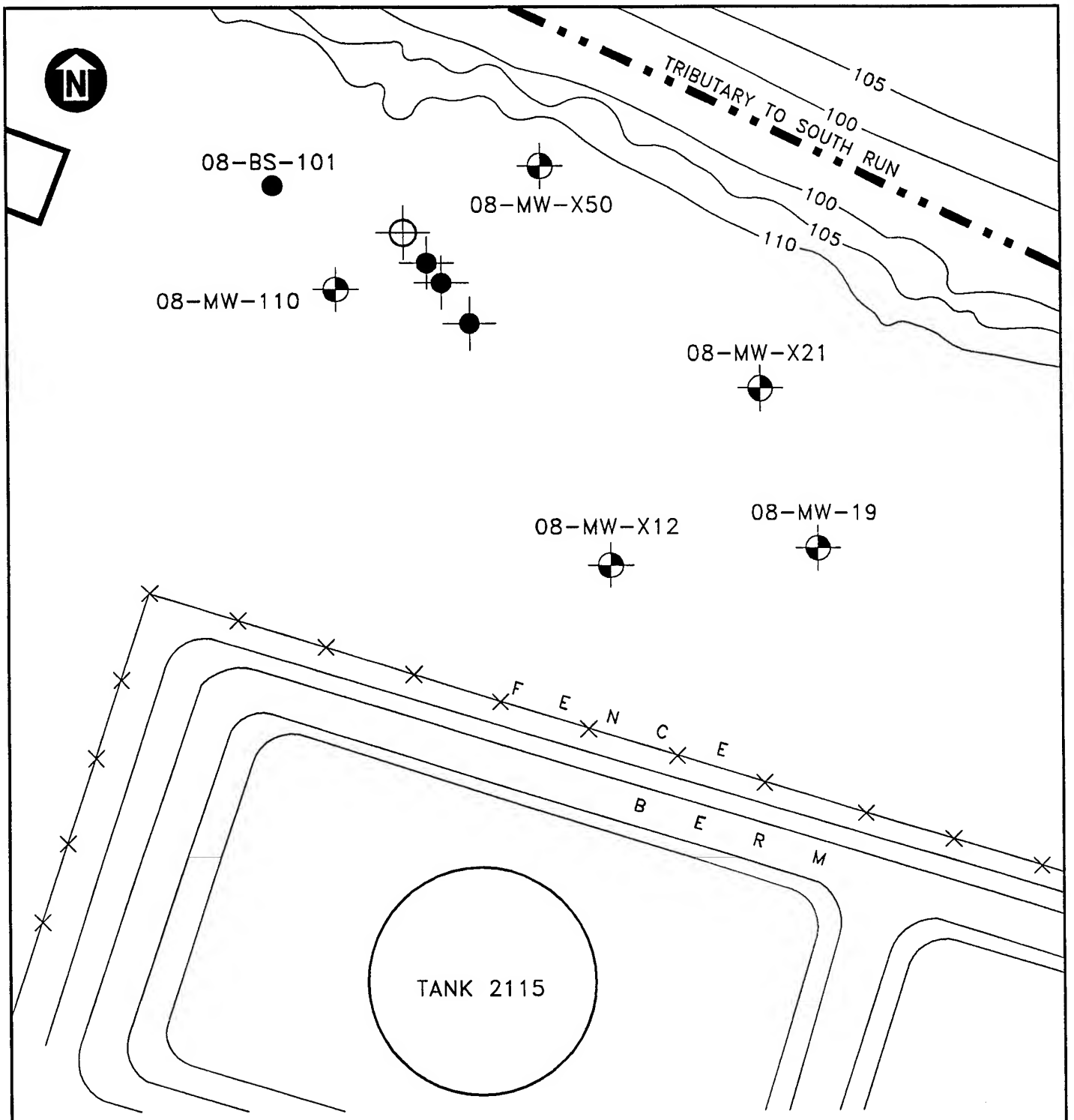
The purpose of this section is to describe the proposed location of one vent well and three vapor monitoring points at the BFSA. Soil sampling procedures and the blower configuration that will be used to inject air (oxygen) into contaminated soils are also discussed in this section. Pilot test activities will be confined to unsaturated soils remediation; no dewatering will take place during the pilot tests. Existing monitoring wells will not be used as primary air injection or extraction wells. However, monitoring wells which have a portion of their screened interval above the water table may be used as vapor monitoring points or to measure the composition of background soil gas.

### 3.2 WELL SITING AND CONSTRUCTION

A general description of criteria for siting the central venting well and the associated vapor monitoring points are included in the attached protocol. Figure 3.1 illustrates the proposed location of the central vent well and monitoring points at the BFSA. These locations were selected based on available analytical data and boring logs. These data show elevated hydrocarbon contamination extending from near the surface to the groundwater table near monitoring well MW-110 and soil boring BS-101. This area is expected to have a high average TPH concentration. Soils in this area are expected to be oxygen depleted (< 2%) and increased biological activity should be stimulated by oxygen-rich soil gas ventilation during pilot-scale operations. The final location of this well may vary slightly from the proposed location if significant fuel contamination is not observed in the boring for the central vent well.

Due to the relatively shallow depth of contamination at this site and the potential for moderate permeability soils, the radius of venting influence around the central air injection well is expected to approach 40 feet. Three vapor monitoring points will be located within a 40-foot radius of the central vent well. A background well will also be installed on the opposite side of the tributary to the South Run adjacent to the bioventing test area. The background well will be used to measure background levels of oxygen and carbon dioxide and to determine if natural carbon sources are contributing to oxygen uptake during the in situ respiration test. Additional details on the in situ respiration test are found in Section 5.7 of the attached protocol document.

The vent well will be constructed of 4-inch ID Schedule 40 PVC, with a ten foot interval of 0.04 slotted screen set between 5 and 15 feet below ground surface (the deepest seasonal groundwater elevation). Flush-threaded PVC casing and screen will be used with no organic solvents or glues. The filter pack will be clean, well-rounded silica sand with a 6-9 grain size and will be placed in the annular space of the screened interval. A 3-foot layer of bentonite will be placed directly over the




LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- PROPOSED VENT WELL LOCATION
- PROPOSED AIR MONITORING POINT

APPROXIMATE SCALE

0 60 120 FT.

SOURCE: ABB ENVIRONMENTAL SERVICES, INC.

FIGURE 3.1

PROPOSED PILOT STUDY
TEST AREA
BULK FUEL STORAGE AREA

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Syracuse, New York

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filter pack. The first foot of bentonite will consist of bentonite pellets hydrated in place with potable water. This layer of pellets will prevent the addition of bentonite slurry from saturating the filter pack. The remaining two feet of bentonite will be fully hydrated and mixed above ground and the slurry tremied into the annular space to produce an air tight seal above the screened interval. A complete seal is critical to prevent injected air from short-circuiting to the surface during the bioventing test. Figure 3.2 illustrates the proposed central vent well construction for this site.

A typical multi-depth vapor monitoring point installation for this site is shown in Figure 3.3. Because of the rather shallow depth to groundwater, only two air monitoring points will be required for each location. Soil gas oxygen and carbon dioxide concentrations will be monitored at depth intervals of approximately 3-4 feet and 8-9 feet at each location. Multi-depth monitoring will confirm that the entire soil profile is receiving oxygen and be used to measure fuel biodegradation rates at both depths. The annular space between these two monitoring points will be sealed with bentonite to isolate the monitoring intervals. As with the central vent well, several inches of bentonite pellets will be used to shield the filter pack from rapid infiltration of bentonite slurry additions. Additional details on vent well and monitoring point construction are found in Section 4 of the protocol document.

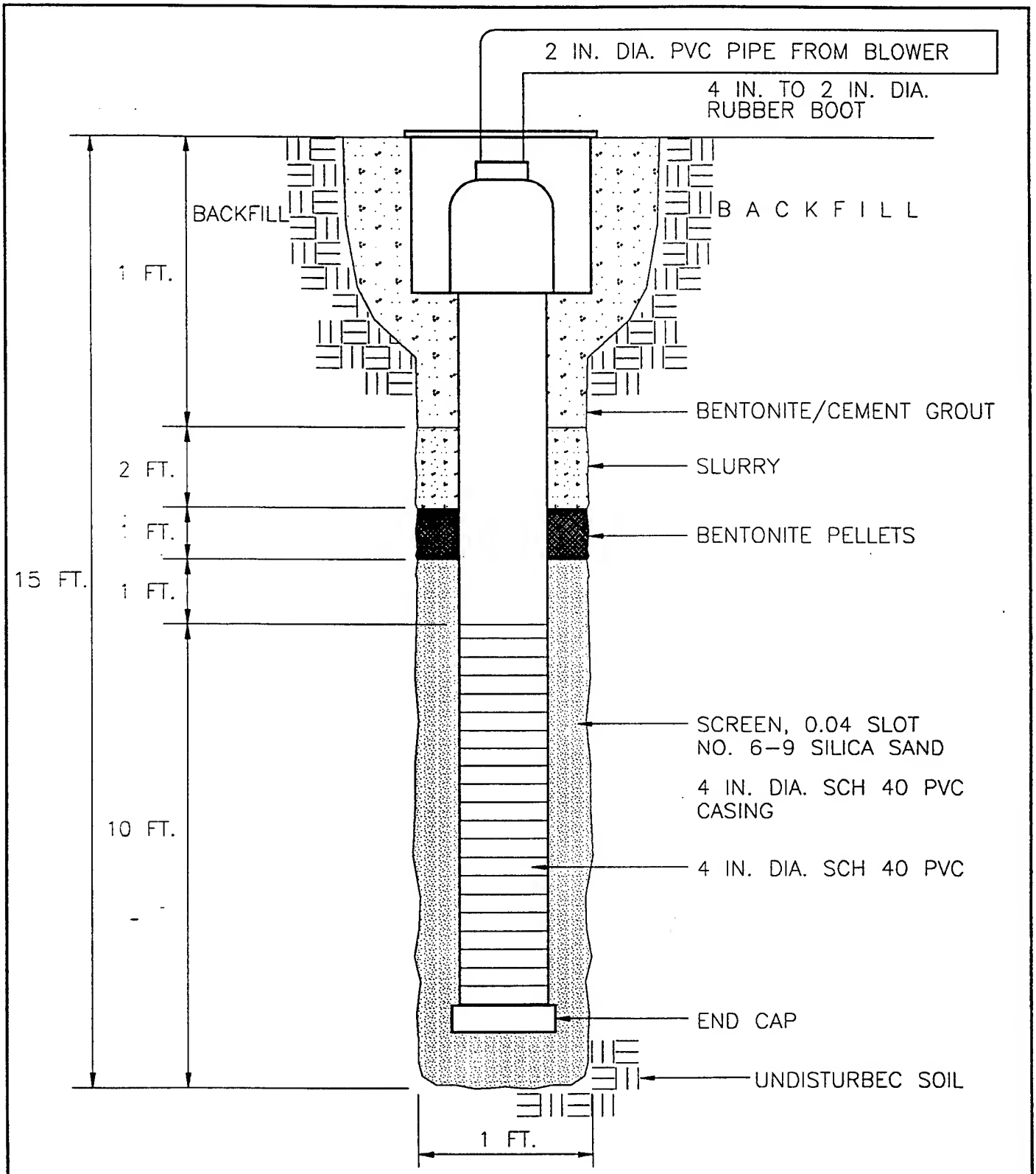
### 3.3 HANDLING OF DRILL CUTTINGS

Drill cuttings from all borings will be left at each location in accordance with the current procedures for ongoing remedial investigations.

### 3.4 SOIL SAMPLING

Three soil samples will be collected from the pilot test area during the installation of the vent well and monitoring points. One sample will be collected from the most contaminated interval of the central vent well boring, and one sample will be collected from the interval of highest apparent contamination in two of the borings for the three air monitoring points. Continuous split spoon sampling will be performed during the vent well and air monitoring point installations. The sample with the highest headspace PID reading from each boring will be selected for analysis. Soil samples will be analyzed for TPH, BTEX, soil moisture, pH, particle sizing, alkalinity, total iron and nutrients.

Samples will be collected using a split-spoon sampler containing brass tube liners. A photoionization detector or total hydrocarbon vapor analyzer (see protocol Section 4.5.2) will be used to insure that breathing zone levels of volatiles do not exceed 1 ppm during drilling and to screen split spoon samples for intervals of high fuel contamination. Soil samples collected in the brass tubes will be immediately trimmed and aluminum foil and a plastic cap placed over the ends. Soil samples will be labelled following the nomenclature specified in the protocol document(Section 5.5), wrapped in plastic, and placed in an ice chest for shipment. A chain of custody form will be filled out and the ice chest shipped to the Engineering Science laboratory in Berkeley, California for analysis. This laboratory has been audited by




NOT TO SCALE

FIGURE 3.2

BULK FUEL STORAGE AREA
INJECTION VENTING WELL
CONSTRUCTION DETAIL

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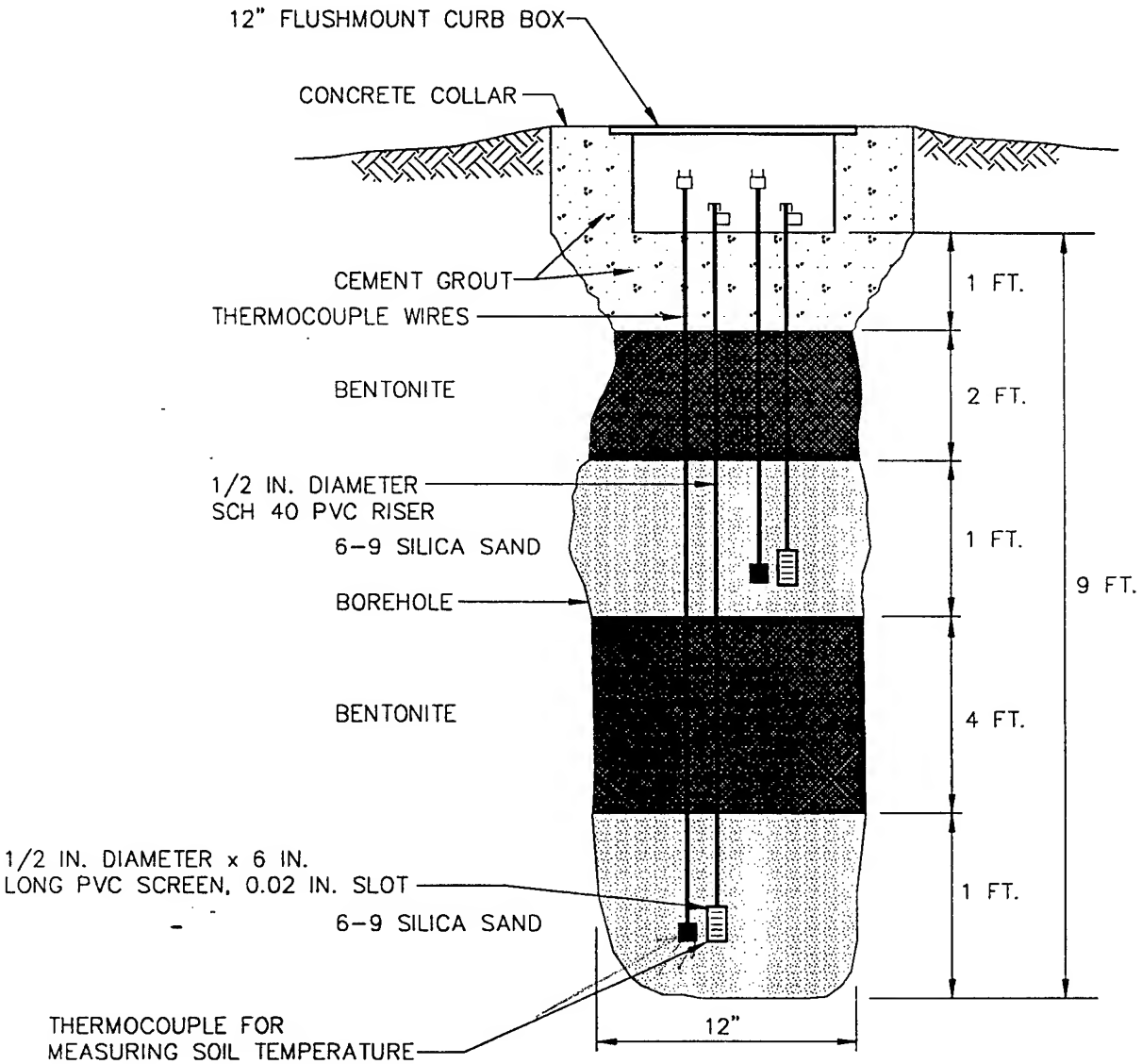


FIGURE 3.3

BULK FUEL STORAGE AREA
MONITORING POINT
CONSTRUCTION DETAIL

McGuire A.F.B., New Jersy

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Syracuse, New York

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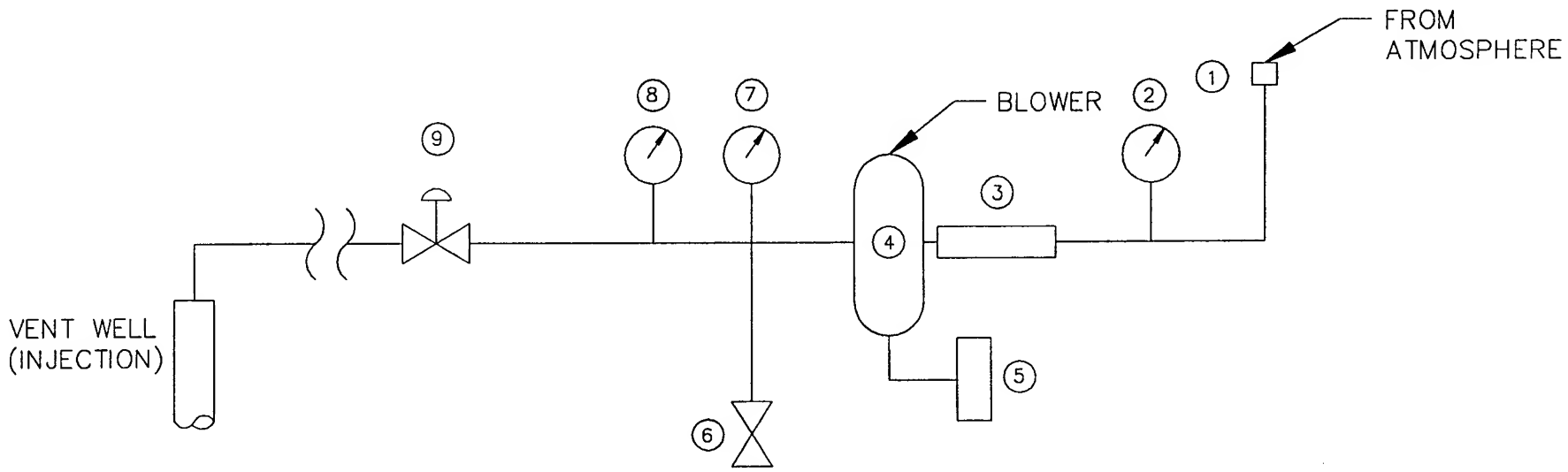
the U.S. Air Force and meets all their quality assurance/quality control and certification requirements.

### 3.5 AIR INJECTION SYSTEM

A 5-HP rotary lobe blower capable of injecting 30 - 60 scfm will be used to conduct the initial air permeability test at these sites. This blower provides a wide range of flow rates and should develop sufficient pressure to move air through moderate permeability soils. Air injection will be used to provide oxygen to soil bacteria and to minimize emissions of volatiles to the atmosphere. If initial testing indicates that less pressure is required to supply oxygen throughout the test volume, a smaller blower will be installed for extended testing at the site.

An extended pilot test will be performed at the BFSA site if initial pilot testing is positive. The extended bioventing test will be initiated following regulatory approval. Figure 3.4 is a schematic of a typical air injection system that will be used for pilot testing at these sites.

The maximum power requirement anticipated for this pilot test is a 230-Volt, Single-Phase, 50 Amp service. Additional details on power supply requirements are described in Section 5.0, Base Support Requirements.




1. INLET FILTER
2. VACUUM GAUGE – INCHES OF H20
3. DRIVE MOTOR
   2.5 HP / 3450 RPM @ 60 Hz / 230 v / SINGLE PHASE / 15 A /
4. BLOWER – GAST R5125
   145 SCFM @ 3450 RPM / REGENERATIVE
5. STARTER
   230 v / 27 A / SINGLE PHASE / H1036 HEATER (10.8 A)
6. AUTOMATIC PRESSURE RELIEF VALVE - SET @ 6 psig
7. PRESSURE GAGE (INCHES OF H20)
8. THERMOMETER (FAHRENHEIT)
9. MANUAL PRESSURE RELIEF (BLEED) VALVE – 1 1/2" BALL

FIGURE 3.4

SCHEMATIC OF BLOWER SYSTEM FOR AIR INJECTION BULK FUELS STORAGE AREA

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Syracuse, New York

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## SECTION 4

## EXCEPTIONS TO PROTOCOL PROCEDURES

No exceptions to the attached protocol are anticipated at this site.

## SECTION 5

## BASE SUPPORT REQUIREMENTS

The following base support is needed prior to the arrival of a driller and the Engineering-Science test team:

- Confirmation of regulatory approval for the pilot test.
- Assistance in obtaining a digging permit at each site.
- A breaker box within 100 feet of the site which can supply 230 Volt, Single-Phase 50 Amp service for the initial and extended pilot test.
- Provide any paperwork required to obtain gate passes and security badges for approximately two Engineering Science employees and two drillers. Vehicle passes will be needed for two trucks and a drill rig.

During the initial three week pilot test the following base support is needed:

- Twelve square feet of desk space and a telephone in a building located as near to the site as practical.
- The use of a fax machine for transmitting 15 to 20 pages of test results.

During the one year extended pilot test on the BFSA site:

- Check the blower system at least once a week to ensure that it is operating and to record the air injection pressure. Engineering-Science will provide a brief training session on this procedure.
- Notify Mr. Doug Downey or Ms Gail Saxton, Engineering-Science, Inc., Denver (303) 831-8100, Mr. David Brown ES-Syracuse (315) 451-9560 or Mr. Jim Williams of the AFCEE, (800) 821-4528, ext. 293 if the blower or motor stop working.
- Arrange site access for an Engineering-Science technician to conduct in situ respiration tests approximately six months and one year after the initial pilot test.

## SECTION 6

## PROJECT SCHEDULE

The following schedule is contingent upon timely approval of this pilot test work plan.

| Event | Date |
|---|---|
| Draft Test Work Plan to AFCEE | 17 August1992 |
| Submit Test Plan for Regulatory Approval | 21 August 1992 |
| Regulatory Approval To Proceed | 31 August 1992 |
| Begin Pilot Test | 7 September 1992 |
| Complete Initial Pilot Test | 30 September 1992 |
| Interim Results Report | 16 October 1992 |
| Respiration Test | March 1993 |
| Final Respiration Test | September 1993 |

## SECTION 7

## POINTS OF CONTACT

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